

IN THE CLAIMS

A clean version of the entire set of pending claims as amended by this Response is presented on the following page.

Claims 10, 22, 32, 45-58, 60, 62 and 64 are amended as indicated by a marked up version of the rewritten claims, which follows the Remarks, showing all changes relative to the previous version of the claims.

Clean Version of the Entire Set of Pending Claims

1        1.    A DC to DC switching circuit for controlling power  
2    switching devices in a DC to DC converter having first and second  
3    interleaved converter circuits operating into a common load  
4    comprising:

5        a current sense circuit sensing the voltage across a sense  
6    resistor in series with the power supply supplying power to the  
7    power switching devices;

8        a first pulse width modulator controlling the power  
9    switching devices of the first converter circuit;

10       a second pulse width modulator controlling the power  
11    switching devices of the second converter circuit;

12       a feedback circuit responsive to the voltage across the  
13    common load;

14       control circuits for controlling the first and second pulse  
15    width modulators responsive to the feedback circuit and a  
16    commanded output voltage;

17       the control circuits also being responsive to the difference  
18    in the voltage across the sense resistor when the first converter  
19    is drawing power from the power supply through the sense resistor  
20    and the second converter is not, and when the second converter is  
21    drawing power from the power supply through the sense resistor  
22    and the first converter is not, to adjust the relative duty cycle

23 of the first and second converters to tend to minimize the  
24 difference in the voltage across the sense resistor;

25 the current sense circuit, the first pulse width modulator,  
26 the second pulse width modulator, the feedback circuit and the  
27 control circuits being in a single integrated circuit.

1 2. The DC to DC switching circuit of claim 1 wherein the ✓  
2 sense resistor is external to the integrated circuit.

1 3. (Amended) The DC to DC switching circuit of claim 1  
2 further comprised of an integrator having an output responsive to  
3 the integral of an error signal, the error signal being  
4 responsive to the voltage across the common load and a desired  
5 voltage, the control circuits also being responsive to the output  
6 of the integrator.

1 4. The DC to DC switching circuit of claim 3 wherein the  
2 time constant of the integrator is adjustable by the selection of  
3 at least one component external to the integrated circuit.

1 5. The DC to DC switching circuit of claim 3 further  
2 comprised of a differentiator having an output responsive to the  
3 rate of change of the voltage across the common load, the control  
4 circuits also being responsive to the output of differentiator.

1        6.    The DC to DC switching circuit of claim 5 wherein the  
2    time constant of the differentiator is adjustable by the  
3    selection of at least one component external to the integrated  
4    circuit.

1        7.    The DC to DC switching circuit of claim 1 wherein the  
2    control circuits are also responsive to rapid decreases in the  
3    voltage on the common load to turn on the first and second  
4    converter circuits independent of the phase of the first and  
5    second pulse width modulators.

1        8.    The DC to DC switching circuit of claim 7 wherein the  
2    control circuits are also responsive to rapid increases in the  
3    voltage on the common load to turn off the first and second  
4    converter circuits independent of the phase of the first and  
5    second pulse width modulators.

1        9.    The DC to DC switching circuit of claim 1 further  
2    comprised of a load variation circuit coupled to the control  
3    circuits to decrease the voltage on the common load for higher  
4    voltages across the current sense resistor and to increase the  
5    voltage on the common load for lower voltages across the current  
6    sense resistor.

1        10. (Twice Amended) DC to DC switching circuit for  
2        controlling power switching devices in a DC to DC converter  
3        having first and second converter circuits operating into a  
4        common load comprising:  
5        a first pulse width modulator controlling the power  
6        switching devices of the first converter circuit;  
7        a second pulse width modulator controlling the power  
8        switching devices of the second converter circuit;  
9        a feedback circuit responsive to the voltage across the  
10       common load;  
11       control circuits for controlling the first and second pulse  
12       width modulators responsive to the feedback circuit, the  
13       operation of the first and second pulse width modulators being  
14       interleaved;  
15       the control circuits also being responsive to the difference  
16       in currents through the first converter and the second converter  
17       to adjust the relative duty cycle of the first and second  
18       converters to tend to minimize the difference in the voltage  
19       across a sense resistor;  
20       the first pulse width modulator, the second pulse width  
21       modulator, the feedback circuit and the control circuits being in  
22       a single integrated circuit.

1        11. The DC to DC switching circuit of claim 10 wherein the  
2        commanded output voltage is controllable through an input to the  
3        integrated circuit.

1        12. The DC to DC switching circuit of claim 10 wherein the  
2        commanded output voltage is controllable through a digital input  
3        to the integrated circuit.

1        13. (Amended) The DC to DC switching circuit of claim 12  
2        further comprised of an integrator having an output responsive to  
3        the integral of an error signal, the error signal being  
4        responsive to the voltage across the common load and a desired  
5        voltage, the control circuits also being responsive to the output  
6        of the integrator.

1        14. The DC to DC switching circuit of claim 13 wherein the  
2        time constant of the integrator is adjustable by the selection of  
3        at least one component external to the integrated circuit.

1        15. The DC to DC switching circuit of claim 13 further  
2        comprised of a differentiator having an output responsive to the  
3        rate of change of the voltage across the common load, the control  
4        circuits also being responsive to the output of differentiator.

1        16. The DC to DC switching circuit of claim 15 wherein the  
2 time constant of the differentiator is adjustable by the  
3 selection of at least one component external to the integrated  
4 circuit.

1        17. The DC to DC switching circuit of claim 12 wherein the  
2 control circuits are also responsive to rapid decreases in the  
3 voltage on the common load to turn on the first and second  
4 converter circuits independent of the phase of the first and  
5 second pulse width modulators.

1        18. The DC to DC switching circuit of claim 17 wherein the  
2 control circuits are also responsive to rapid increases in the  
3 voltage on the common load to turn off the first and second  
4 converter circuits independent of the phase of the first and  
5 second pulse width modulators.

1        19. The DC to DC switching circuit of claim 12 further  
2 comprised of a load variation circuit coupled to the control  
3 circuits to decrease the voltage on the common load for higher  
4 currents through the converters and to increase the voltage on  
5 the common load for lower currents through the converters.

1        20. The DC to DC switching circuit of claim 12 wherein the  
2        commanded output voltage is controllable through an input to the  
3        integrated circuit.

1        21. The DC to DC switching circuit of claim 12 wherein the  
2        commanded output voltage is controllable through a digital input  
3        to the integrated circuit.

1        22. (Three Times Amended) A DC to DC converter having a  
2        plurality of converter circuits for operating into a common load,  
3        comprising:

4        a plurality of buck converter circuits operating into the  
5        common load, each buck converter circuit having an inductor for  
6        alternately conducting between the first power supply terminal  
7        and the common load, and the second power supply terminal and the  
8        common load;

9        a plurality of pulse width modulators driven by a common  
10       oscillator in an interleaved manner, each pulse width modulator  
11       controlling one of the plurality of buck converter circuits,  
12       whereby the operation of the buck converter circuits is  
13       interleaved;

14       a feedback circuit responsive to a voltage across the common  
15       load;



16 a voltage control circuit controlling the plurality of pulse  
17 width modulators responsive to the feedback circuit and a  
18 commanded output voltage; and

19 a current balance control circuit responsive to the  
20 difference in currents in the plurality of interleaved buck  
21 converter circuits and controlling the pulse width modulators to  
22 balance the currents in the plurality of interleaved buck  
23 converter circuits;

24 the plurality of pulse width modulators and the control  
25 circuits being in a single integrated circuit.

1 24. (Twice Amended) The DC to DC converter of claim 22  
2 further comprised of an integrator having an output responsive to  
3 the integral of an error signal, the error signal being  
4 responsive to the voltage across the common load and a desired  
5 voltage, the control circuits also being responsive to the output  
6 of the integrator.

1 25. (Amended) The DC to DC converter of claim 24 wherein a  
2 time constant of the integrator is adjustable by the selection of  
3 at least one component external to the integrated circuit.

1 26. (Amended) The DC to DC converter of claim 24 further  
2 comprised of a differentiator having an output responsive to the

3 rate of change of the voltage across the common load, the control  
4 circuits also being responsive to the output of differentiator.

1 27. (Amended) The DC to DC converter of claim 26 wherein  
2 the time constant of the differentiator is adjustable by the  
3 selection of at least one component external to the integrated  
4 circuit.

1 28. (Amended) The DC to DC converter of claim 22 wherein  
2 the control circuits are also responsive to rapid decreases in  
3 the voltage across the common load to turn on the plurality of  
4 buck converter circuits independent of the phase of the plurality  
5 of pulse width modulators.

1 29. (Amended) The DC to DC converter of claim 28 wherein  
2 the control circuits are also responsive to rapid increases in  
3 the voltage across the common load to turn off the plurality of  
4 buck converter circuits independent of the phase of the plurality  
5 of pulse width modulators.

1 30. (Amended) The DC to DC converter of claim 22, wherein  
2 the plurality of pulse width modulators consist of a pair of  
3 pulse width modulators.

1 31. (Amended) The DC to DC converter of claim 22 wherein  
2 the feedback circuit is in the single integrated circuit.

1        32. (Three Times Amended) A DC to DC converter having a  
2 plurality of converter circuits operating into a common load,  
3 comprising:

4        a plurality of buck converter circuits operating into the  
5 common load, each buck converter circuit having an inductor for  
6 alternately conducting between the first power supply terminal  
7 and the common load, and the second power supply terminal and the  
8 common load;

9        a plurality of pulse width modulators each controlling one  
10 of the plurality of buck converter circuits, the operation of the  
11 pulse width modulators and the buck converter circuits being  
12 interleaved;

13       a feedback circuit responsive to a voltage across the common  
14 load;

15       control circuits responsive to the feedback circuit and a  
16 commanded output voltage to control a nominal duty cycle of the  
17 plurality of buck converter circuits, the control circuits also  
18 being responsive to the difference in currents in the plurality  
19 of interleaved buck converter circuits to adjust relative duty  
20 cycles of the plurality of buck converter circuits to balance the  
21 currents in the buck converter circuits;

22       the plurality of pulse width modulators and the control  
23 circuits being in a single integrated circuit.

1        34. (Twice Amended) The DC to DC converter of claim 32  
2 wherein the control circuits control the plurality of pulse width  
3 modulators.

1        35. (Amended) The DC to DC converter of claim 32 further  
2 comprising an integrator having an output responsive to the  
3 integral of an error signal, the error signal being responsive to  
4 the voltage across the common load and a desired voltage.

1        36. (Twice Amended) The DC to DC converter of claim 35,  
2 wherein the control circuits are also responsive to the output of  
3 the integrator.

1        37. (Amended) The DC to DC converter of claim 35 wherein a  
2 time constant of the integrator is adjustable by the selection of  
3 at least one component external to the integrated circuit.

1        38. (Amended) The DC to DC converter of claim 35 further  
2 comprising a differentiator having an output responsive to a rate  
3 of change of the voltage across the common load, the control  
4 circuits also being responsive to the output of differentiator.

1        39. (Amended) The DC to DC converter of claim 38 wherein a  
2 time constant of the differentiator is adjustable by the

3 selection of at least one component external to the integrated  
4 circuit.

1 40. (Amended) The DC to DC converter of claim 32 wherein  
2 the control circuits are also responsive to rapid decreases in  
3 the voltage across the common load to turn on the plurality of  
4 buck converter circuits, independent of the phase of the  
5 plurality of pulse width modulators.

1 41. (Amended) The DC to DC converter of claim 32 wherein  
2 the control circuits are also responsive to rapid increases in  
3 the voltage across the common load to turn off the plurality of  
4 buck converter circuits, independent of the phase of the  
5 plurality of pulse width modulators.

1 42. (Amended) The DC to DC converter of claim 32, wherein  
2 the plurality of pulse width modulators consist of a pair of  
3 pulse width modulators.

1 43. (Amended) The DC to DC converter of claim 32 wherein  
2 the commanded output voltage is controllable through an input to  
3 the integrated circuit.

1 44. (Amended) The DC to DC converter of claim 32 wherein  
2 the feedback circuit is in the single integrated circuit.

1        45. (Three Times Amended) A DC to DC converter having a  
2 plurality of converter circuits operating into a common load,  
3 comprising:

4        a plurality of buck converter circuits operating into the  
5 common load, each buck converter circuit having an inductor for  
6 alternately conducting between the first power supply terminal  
7 and the common load, and the second power supply terminal and the  
8 common load;

9        a plurality of pulse width modulators each controlling one  
10 of the plurality of buck converter circuits, the operation of the  
11 pulse width modulators being interleaved;

12       control circuits for adjusting a nominal duty cycle of the  
13 plurality of interleaved buck converter circuits, the control  
14 circuits also being responsive to the difference in currents in  
15 the plurality of interleaved buck converter circuits to adjust  
16 the relative duty cycles of the plurality of buck converter  
17 circuits to balance the currents therein;

18       the plurality of pulse width modulators and the control  
19 circuits being in a single integrated circuit.

1       46. (Twice Amended) A DC to DC converter having first and  
2 second converter circuits operating into a common load,  
3 comprising:

4 first and second buck converter circuits operating into the  
5 common load, each buck converter circuit having an inductor for  
6 alternately conducting between the first power supply terminal  
7 and the common load, and the second power supply terminal and the  
8 common load;

9 a first pulse width modulator controlling the first buck  
10 converter circuit;

11 a second pulse width modulator controlling the second buck  
12 converter circuit;

13 a feedback circuit responsive to the voltage across the  
14 common load;

15 control circuits for controlling the first and second pulse  
16 width modulators responsive to the feedback circuit;

17 the control circuits also being responsive to current  
18 measurements in the first buck converter circuit and the second  
19 buck converter circuit for adjusting the relative duty cycle of  
20 the first and second pulse width modulators to balance the  
21 currents in the buck converter circuits;

22 the first pulse width modulator, the second pulse width  
23 modulator, the feedback circuit and the control circuits being in  
24 a single integrated circuit.

1 47. (Twice Amended) A DC to DC converter having a  
2 plurality of converter circuits operating into a common load,  
3 comprising:

4 a plurality of buck converter circuits operating into the  
5 common load, each buck converter circuit having an inductor for  
6 alternately conducting between the first power supply terminal  
7 and the common load, and the second power supply terminal and the  
8 common load;

9 a plurality of pulse width modulators driven by a common  
10 oscillator in an interleaved manner, each pulse width modulator  
11 controlling one of the plurality of buck converter circuits,  
12 whereby the operation of the buck converter circuits is  
13 interleaved;

14 a feedback circuit responsive to a voltage across the common  
15 load;

16 a voltage control circuit for controlling the plurality of  
17 pulse width modulators responsive to the feedback circuit and a  
18 commanded output voltage; and

19 a current balance control circuit responsive to the  
20 difference in currents in the plurality of interleaved buck  
21 converter circuits for controlling the pulse width modulators to  
22 balance the currents in the plurality of interleaved buck  
23 converter circuits;

24 the plurality of pulse width modulators, the feedback  
25 circuit, the voltage control circuit and the current balance  
26 control circuit being in a single integrated circuit.



1        48. (Twice Amended) A DC to DC converter having a  
2 plurality of converter circuits operating into a common load,  
3 comprising:

4        a plurality of buck converter circuits operating into the  
5 common load, each buck converter circuit having an inductor for  
6 alternately conducting between the first power supply terminal  
7 and the common load, and the second power supply terminal and the  
8 common load;

9        a plurality of pulse width modulators each controlling power  
10 switching devices of one of the plurality of interleaved buck  
11 converter circuits, the operation of the pulse width modulators  
12 and the buck converter circuits being interleaved;

13       a feedback circuit responsive to a voltage across the common  
14 load;

15       control circuits responsive to the feedback circuit and a  
16 commanded output voltage to control a nominal duty cycle of the  
17 plurality of buck converter circuits, the control circuits also  
18 being responsive to the difference in currents in the plurality  
19 of interleaved buck converter circuits to adjust the relative  
20 duty cycles of the plurality of buck converter circuits to  
21 balance the currents in the buck converter circuits;

22       the plurality of pulse width modulators, the feedback  
23 circuit and the control circuits being in a single integrated  
24 circuit.

1        49. (Twice Amended) A DC to DC converter having a  
2 plurality of converter circuits operating into a common load,  
3 comprising:

4        a plurality of buck converter circuits operating into the  
5 common load, each buck converter circuit having an inductor for  
6 alternately conducting between the first power supply terminal  
7 and the common load, and the second power supply terminal and the  
8 common load;

9        a plurality of pulse width modulators each controlling one  
10 of the plurality of buck converter circuits, the pulse width  
11 modulators being driven by a common oscillator signal so that the  
12 operation of the pulse width modulators is interleaved;

13       control circuits for adjusting a nominal duty cycle of the  
14 plurality of interleaved buck converter circuits to control a  
15 voltage on the common load, and for responding to the difference  
16 in currents in the plurality of interleaved buck converter  
17 circuits to adjust the relative duty cycles of the plurality of  
18 buck converter circuits to balance the currents in the buck  
19 converter circuits;

20       the plurality of pulse width modulators and the control  
21 circuits being in a single integrated circuit.

1        50. (Twice Amended) A DC to DC converter having first and  
2 second converter circuits operating into a common load,  
3 comprising:

4        first and second buck converter circuits operating into the  
5 common load, each buck converter circuit having an inductor for  
6 alternately conducting between the first power supply terminal  
7 and the common load, and the second power supply terminal and the  
8 common load;

9        a first pulse width modulator controlling the first buck  
10 converter circuit;

11       a second pulse width modulator controlling the second buck  
12 converter circuit;

13       a feedback circuit responsive to the voltage across the  
14 common load;

15       control circuits for controlling the first and second pulse  
16 width modulators responsive to the feedback circuit;

17       the control circuits also being responsive to current  
18 measurements through the first buck converter circuit and the  
19 second buck converter circuit to adjust the relative duty cycle  
20 of the first and second buck converter circuits

21       the first pulse width modulator, the second pulse width  
22 modulator and the control circuits being in a single integrated  
23 circuit.

1           51. (Twice Amended) A DC to DC converter comprising:

2           a plurality of buck converter circuits operating into the  
3 common load, each buck converter circuit having an inductor for  
4 alternately conducting between the first power supply terminal  
5 and the common load, and the second power supply terminal and the  
6 common load;

7           a plurality of pulse width modulators driven by a common  
8 oscillator in an interleaved manner, each pulse width modulator  
9 controlling one of the plurality of buck converter circuits,  
10 whereby the operation of the buck converter circuits is  
11 interleaved;

12          a feedback circuit responsive to a voltage on the common  
13 output;

14          a voltage control circuit for controlling the plurality of  
15 pulse width modulators responsive to the feedback circuit and a  
16 commanded output voltage; and

17          a current balance control circuit for controlling the pulse  
18 width modulators responsive to a difference in currents in the  
19 inductors of the plurality of interleaved buck converter circuits  
20 to balance the currents in the plurality of interleaved buck  
21 converter circuits;

22          the plurality of pulse width modulators and the control  
23 circuits being in a single integrated circuit.

1        52. (Twice Amended) A DC to DC converter having a  
2 plurality of converter circuits operating into a common load,  
3 comprising:

4        a plurality of buck converter circuits operating into the  
5 common load, each buck converter circuit having an inductor for  
6 alternately conducting between the first power supply terminal  
7 and the common load, and the second power supply terminal and the  
8 common load;

9        a plurality of pulse width modulators each controlling power  
10 switching devices of one of the plurality of buck converter  
11 circuits, the operation of the pulse width modulators and the  
12 buck converter circuits being interleaved;

13        a feedback circuit responsive to a voltage across the common  
14 load;

15        control circuits being responsive to the feedback circuit  
16 and a commanded output voltage to control a nominal duty cycle of  
17 the plurality of buck converter circuits, the control circuits  
18 also being responsive to the difference in currents in the  
19 plurality of interleaved buck converter circuits to adjust the  
20 relative duty cycles of the plurality of buck converter circuits  
21 to balance the currents in the buck converter circuits;

22        the plurality of pulse width modulators and the control  
23 circuits being in a single integrated circuit.

1        53. (Twice Amended) A DC to DC converter having first and  
2 second converter circuits operating into a common load,  
3 comprising:

4        first and second buck converter circuits operating into the  
5 common load, each buck converter circuit having an inductor for  
6 alternately conducting between the first power supply terminal  
7 and the common load, and the second power supply terminal and the  
8 common load;

9        a first pulse width modulator controlling the first buck  
10 converter circuit;

11       a second pulse width modulator controlling the second buck  
12 converter circuit;

13       a feedback circuit responsive to the voltage across the  
14 common load;

15       control circuits for controlling the first and second pulse  
16 width modulators responsive to the feedback circuit;

17       the control circuits also being responsive to current  
18 measurements in the first buck converter circuit and the second  
19 buck converter circuit to adjust the relative duty cycle of the  
20 first and second buck converter circuits;

21       the first pulse width modulator, the second pulse width  
22 modulator, the feedback circuit and the control circuits being in  
23 a single integrated circuit.

1        54. (Twice Amended) A DC to DC converter having a  
2 plurality of converter circuits operating into a common load,  
3 comprising:

4        a plurality of buck converter circuits operating into the  
5 common load, each buck converter circuit having an inductor for  
6 alternately conducting between the first power supply terminal  
7 and the common load, and the second power supply terminal and the  
8 common load;

9        a plurality of pulse width modulators driven by a common  
10 oscillator in an interleaved manner, each pulse width modulator  
11 controlling one of the plurality of buck converter circuits,  
12 whereby the operation of the buck converter circuits is  
13 interleaved;

14        a feedback circuit responsive to a voltage across the common  
15 load;

16        a voltage control circuit for controlling the plurality of  
17 pulse width modulators responsive to the feedback circuit and a  
18 commanded output voltage; and

19        a current balance control circuit for controlling the pulse  
20 width modulators to balance the currents in the plurality of  
21 interleaved buck converter circuits responsive to the difference  
22 in currents in the plurality of interleaved buck converter  
23 circuits;

24 the plurality of pulse width modulators, the voltage control  
25 circuit and the current balance control circuit being in a single  
26 integrated circuit.

1 55. (Twice Amended) A DC to DC converter having a  
2 plurality of converter circuits operating into a common load,  
3 comprising:  
4 a plurality of buck converter circuits operating into the  
5 common load, each buck converter circuit having an inductor for  
6 alternately conducting between the first power supply terminal  
7 and the common load, and the second power supply terminal and the  
8 common load;  
9 a plurality of pulse width modulators each controlling power  
10 switching devices of one of the plurality of interleaved buck  
11 converter circuits, the operation of the pulse width modulators  
12 and the buck converter circuits being interleaved;  
13 a feedback circuit responsive to a voltage across the common  
14 load;  
15 control circuits responsive to the feedback circuit and a  
16 commanded output voltage to control a nominal duty cycle of the  
17 plurality of buck converter circuits, the control circuits also  
18 adjusting relative duty cycles of the plurality of buck converter  
19 circuits to balance the currents in the buck converter circuits  
20 responsive to the difference in currents in the plurality of  
21 interleaved buck converter circuits;



22 the plurality of pulse width modulators and the control  
23 circuits being in a single integrated circuit.

1 56. (Twice Amended) A DC to DC converter having a  
2 plurality of converter circuits operating into a common load,  
3 comprising:

4 a plurality of buck converter circuits operating into the  
5 common load, each buck converter circuit having an inductor for  
6 alternately conducting between the first power supply terminal  
7 and the common load, and the second power supply terminal and the  
8 common load;

9 a plurality of pulse width modulators each controlling one  
10 of the plurality of buck converter circuits, the pulse width  
11 modulators being driven by a common oscillator signal so that the  
12 operation of the pulse width modulators is interleaved;

13 control circuits for adjusting a nominal duty cycle of the  
14 plurality of interleaved buck converter circuits to control a  
15 voltage on the common load, and for adjusting relative duty  
16 cycles of the plurality of buck converter circuits to balance the  
17 currents in the buck converter circuits;

18 the plurality of pulse width modulators and the control  
19 circuits being in a single integrated circuit.

1 57. (Twice Amended) A DC to DC converter having first and  
2 second buck converter circuits operating into a common load,  
3 comprising:

4 first and second buck converter circuits operating into the  
5 common load, each buck converter circuit having an inductor for  
6 alternately conducting between the first power supply terminal  
7 and the common load, and the second power supply terminal and the  
8 common load;

9 a first pulse width modulator controlling the first buck  
10 converter circuit;

11 a second pulse width modulator controlling the second buck  
12 converter circuit;

13 a feedback circuit responsive to the voltage across the  
14 common load;

15 control circuits for controlling the first and second pulse  
16 width modulators responsive to the feedback circuit;

17 the control circuits also being responsive to current  
18 measurements in the first buck converter circuit and the second  
19 buck converter circuit to adjust the relative duty cycle of the  
20 first and second pulse width modulators to balance the currents  
21 in the buck converter circuits;

22 the first pulse width modulator, the second pulse width  
23 modulator and the control circuits being in a single integrated  
24 circuit.

1        58. (Amended) A DC to DC converter having a plurality of  
2 converter circuits for operating into a common load, comprising:

3        a plurality of buck converter circuits operating into the  
4 common load, each buck converter circuit having an inductor for  
5 alternately conducting between the first power supply terminal  
6 and the common load, and the second power supply terminal and the  
7 common load;

8        a plurality of pulse width modulators driven by a common  
9 oscillator in an interleaved manner, each pulse width modulator  
10 controlling one of the plurality of buck converter circuits,  
11 whereby the operation of the buck converter circuits is  
12 interleaved;

13        a feedback circuit responsive to a voltage across the common  
14 output;

15        a voltage control circuit controlling the plurality of pulse  
16 width modulators responsive to the feedback circuit and a  
17 commanded output voltage;

18        the plurality of pulse width modulators and the control  
19 circuits being in a single integrated circuit.

1        59. The DC to DC converter of claim 58 further comprising  
2 the common oscillator, the common oscillator also being in the  
3 single integrated circuit.

1        60. (Amended) A DC to DC converter having a plurality of  
2 converter circuits operating into a common load, comprising:

3        a plurality of buck converter circuits operating into the  
4 common load, each buck converter circuit having an inductor for  
5 alternately conducting between the first power supply terminal  
6 and the common load, and the second power supply terminal and the  
7 common load;

8        a plurality of pulse width modulators each controlling one  
9 of the plurality of buck converter circuits, the operation of the  
10 pulse width modulators and the buck converter circuits being  
11 interleaved;

12       a feedback circuit responsive to a voltage across the common  
13 load;

14       control circuits responsive to the feedback circuit and a  
15 commanded output voltage to control a nominal duty cycle of the  
16 plurality of buck converter circuits;

17       the plurality of pulse width modulators and the control  
18 circuits being in a single integrated circuit.

1       61. The DC to DC converter of claim 60 further comprising  
2 the common oscillator, the common oscillator also being in the  
3 single integrated circuit.

1        62. (Amended) A DC to DC converter comprising:

2        first and second buck converter circuits operating into a  
3        common load, each buck converter circuit having an inductor for  
4        alternately conducting between the first power supply terminal  
5        and the common load, and the second power supply terminal and the  
6        common load;

7        first and second pulse width modulators driven by a common  
8        oscillator in an interleaved manner, each pulse width modulator  
9        controlling a respective one of the first and second buck  
10       converter circuits, whereby the operation of the buck converter  
11       circuits is interleaved;

12       a feedback circuit responsive to a voltage across the common  
13       output;

14       a voltage control circuit controlling the first and second  
15       pulse width modulators responsive to the feedback circuit and a  
16       commanded output voltage;

17       the plurality of pulse width modulators and the control  
18       circuits being in a single integrated circuit.

1       63. The DC to DC converter of claim 62 further comprising  
2       the common oscillator, the common oscillator also being in the  
3       single integrated circuit.

1        64. (Amended) A DC to DC converter comprising:

2        first and second buck converter circuits operating into a  
3        common load, each buck converter circuit having an inductor for  
4        alternately conducting between the first power supply terminal  
5        and the common load, and the second power supply terminal and the  
6        common load;

7        first and second pulse width modulators each controlling a  
8        respective one of the buck converter circuits, the operation of  
9        the pulse width modulators and the buck converter circuits being  
10       interleaved;

11       a feedback circuit responsive to a voltage across the common  
12       load;

13       control circuits responsive to the feedback circuit and a  
14       commanded output voltage to control a nominal duty cycle of the  
15       plurality of buck converter circuits;

16       the plurality of pulse width modulators and the control  
17       circuits being in a single integrated circuit.

1       65. The DC to DC converter of claim 64 further comprising  
2       the common oscillator, the common oscillator also being in the  
3       single integrated circuit.